BALLY MANUFACTURING CORPORATION, a Delaware corporation,

Plaintiff/Counterdefendant,

vs.

D. GOTTLIEB & CO., a corporation, WILLIAMS ELECTRONICS, INC., a corporation, and ROCKWELL INTERNATIONAL CORPORATION,

Defendants/Counterplaintiffs.

)Docket No.
)78 C 2246
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) Chicago, Illinois
) March 14, 1984
) 9:45 a.m.
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VOLUME XIII-A
TRANSCRIPT OF PROCEEDINGS
BEFORE THE HONORABLE JOHN F. GRADY

TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
MR. MELVIN M. GOLDENBERG

APPEARANCES:

For the Plaintiff/
Counterdefendant:

MR. KATZ
MR. TONE
MR. MATHIAS
MR. SCHNAYER
MS. SIGEL
MR. BURNS

For the Defendants/
Counterplaintiffs:

MR. GOLDENBERG
MR. RIFKIN
MR. ELLIOTT
MR. LYNCH
MR. HARDING
MR. GOTTLIEB

Court Reporter:

LAURA M. BRENNAN
219 South Dearborn Street, Room 1918
Chicago, Illinois 60604

THE CLERK: 78 C 2246, Bally Manufacturing versus Gottlieb, case on trial.

THE COURT: Good morning, counsel.

MR. TONE: Good morning, your Honor.

MR. LYNCH: Good morning, your Honor.

THE COURT: Before we get started, let me say that I decided, as far as Mr. Katz' situation was concerned, that we were just not going to take another recess.

We've given one continuing legal education break to each side, or at least an extracurricular break to each side; one to Mr. Tone and one to Mr. Goldenberg. So that's even up. And from now on we keep going until we finish. Okay.

Now, where were we?

MR. LYNCH: We were cross-examining Dr. Schoeffler.

THE COURT: Dr. Schoeffler, will you resume the stand, please.

DR. JAMES SCHOEFFLER, Plaintiff's witness, previously sworn

CROSS EXAMINATION (Resumed)

MR. LYNCH: If I may, your Honor, I would like to mark some of these charts that --

THE COURT: All right.

MR. LYNCH: -- that had been manufactured, or that I prepared during the last session.

THE COURT: All right.

MR. LYNCH: I'd like to mark as Exhibit 20-A -- It's a series of Exhibit 20, a series of charts on noise technique.

BY MR. LYNCH:

Q You will recall, Dr. Schoeffler, these noise techniques corresponded to those you articulated in the patent. Do you recall that?

A Yes.

Q And these are your comments with respect to them, including the claims that specifically addressed those various topics.

A Yes, sir.

MR.LYNCH: I will mark those, your Honor, as 20-A, that is, the chart with noise techniques 1, 2 and 3; 20-B, the sheet referring to noise techniques 4, 5, 6 and 7; 20-C as the one referring to noise techniques 8, 9 and 10, as outlined in the patent by Dr. Schoeffler; 20-D, that page referring to techniques 11, 12, 13, 14 and 15 in the 441 patent; and as 20-E, noise techniques which were articulated as being software techniques 16, 17, 18, 19 and 20.

BY MR. LYNCH:

Q I don't believe that you'll find those colored in the patent, but you did testify about them, correct,

Doctor Schoeffler?

A That is correct.

Q. I would then like to mark as Exhibit 19-E -- I am sorry -- 19-F, your Honor, a chart that referred to Plaintiff's Exhibit 430.

430, you will recall, Dr. Schoeffler, was the Bally Electronics Games' Theory of Operation manual?

A. Yes, sir.

Q. We articulated for noise fixes that are referred to in there, correct?

A. That were listed in there, that is correct.

Q. None of them appear either in the Flicker Game or the '441 patent, correct?

A. That is correct.

Q. That is 19-F.

19-G, then we had a discussion about the error recovery aspects of the alleged invention of the '441 patent, correct?

A. We had a discussion, that is correct.

Q. I prepared this chart , 19-G, at that time?

A. Yes, sir.

Q. We had then a discussion about the real time other than error recovery aspects, and I will call that 19-H.

Do you recall that testimony, Dr. Schoeffler?

A. Yes, sir.

Q. And at 19-I, a chart prepared referring to the matrix multiplexing aspects of the alleged invention of the '441

patent, do you recall me preparing this, Dr. Schoeffler?

A. Yes, I do.

Q. Let us get to this one, Dr. Schoeffler, because it raises a matter that perhaps we can address that was investigated during the break.

In your testimony you indicated that in connection with the matrix multiplexing aspect of the patent, there was a slow turn-on transistor?

A. Transistors.

Q. Transistors, and those resulted in a rise time of 5 microseconds in the Flicker Game?

A. What I testified was that in looking up those transistors in the transistor manual, the turn-on time -- is what it is called -- is listed as 2 and a half microseconds typically for those transistors, which means that in the actual circuit, it could be anywhere from there to around this time.

Q. The 5 microseconds was your estimate, correct, Doctor?

A. 2 and a half microseconds is the value of the parameter. So in the circuit, it would be that or perhaps longer than that.

Actually, 5 microseconds is probably closer to the turn-off time rather than the turn-on time. 2 and a half microseconds would be a more reasonable number since that is listed in the transistor manuals.

Q. Now, did you have an opportunity to test the Flicker machine for such rise time?

A. The only testing of the Flicker machine that I did was when Dr. Vacroux put an oscilloscope on the machine in the other room here.

Q. Did you ascertain what the rise time was at that time, or did you not?

A. At that time the 2 measurements were made, they were extremely awkward measurements and difficult ones, and it was not clear precisely what was being measured.

In particular, the current, which is the important thing, was not being measured, but the voltage. However, in the first measurement, the order of magnitude that was measured was on the order of 2 microseconds for a portion of the rise time. So it was consistent with the transistor parameter.

Q. 2 microseconds?

A. That is the number that was recorded for a portion of the rise time.

The measurement was too difficult to be very precise beyond that.

Q Now, what we are talking about here is in each of the strobe cycles that the microprocessor goes through, there is a time period of 10.8 microseconds, correct, 10.8 microseconds for each instruction, correct?

A. That is one cycle in the 4004 microprocessor. So many instructions are executed in one cycle.

Q. Now, you are indicating that a rise time of one fifth of that value will have a significant effect on the operation of a game such as the Flicker game?

A. What I testified was that one of the noise prevention techniques that was disclosed by Frederiksen in the patent and implemented in the Flicker was the use of these transistors.

What I testified was that a rise time of 2 and a half microseconds to 5 microseconds in that range compared to the rise time of a non-slow turn-on transistor is about 25 to 1.

As it turns out, the noise that is generated due to a rapidly changing pulse is inversely proportional to that. And, as a consequence, the use of a slow turn-on transistor instead of a fast one is about a 25 to 1 reduction in the frequency components of the noise that affect the rest of the system.

As indicated in the patent, that does have an effect.

Q. Doctor, let's talk about another aspect of the Flicker machine. Let's talk about the isolation diodes on the playfield.

Now, do you recall, Doctor, that we talked about Defendants' Exhibit 11-E, particularly, the switch matrix at the bottom?

A. Yes, sir.

Q. Do you recall, we talked about these diodes affiliated with each switch in that diagram?

A. I do.

Q. And those are isolation diodes, are they not?

A. Steering diodes, I think is the term, to prevent sneak paths.

Q. Now, to prevent the sneak paths in a switch matrix such as shown in 11-E, there must be such a diode affiliated with each switch. Is that correct?

A. If a sneak path can actually exist, then diodes are necessary.

Where sneak paths do not exist, or cannot exist, then of course the diodes are not needed.

Q. What is your testimony as to whether such diodes are included on the Flicker game?

A. In the switch matrix in the Flicker game there are diodes on some of the switches. Notably the operator adjustable switches and some diodes in the playfield switches at the top of the diagram in the Flicker machine.

Q. Now, the operator adjustable switches, are they operated by the software in the Flicker machine?

A. The operator adjustable switches are plug connections that one uses to set up the game. They are in the switch matrix. So whether they are operated by the -- well, in fact, let me back up a little bit.

No switch is operated by the software, sir. That is, switches are simply read by the software. And so they are read just as much as any other switch, because they are in the same matrix.

Q. I understand that. But in the software arrangement of the Flicker game are those operator adjustable switches accounted for in the software?

A. In the -- what do you mean by accounted for in the software? They are in the --

Q. Is the operation of those switches -- is there provision in the software made for the operation of those switches the way those switches are intended to operate in the field?

A. In the software in the Flicker game those switches are all in the matrix. And in the program the matrix is scanned through column by column, including those columns; and as a consequence, the multiplexing routine and the switch reading routine is there.

Certain of the functions that are available on the operator setup machine have not been implemented in the software; others have.

Q. When we talk about the software, that entire left-hand portion of the switch matrix is shown in the mux charts, which is Plaintiff's -- the figure 4 in the patent.

A. Yes.

Q. Isn't it the case, Doctor, that the Flicker game will not

change its mode of operation based upon what switches on the left-hand side of the mux chart, that is, these 110-K through 30-K switches, it will not change its operation based on how they are hooked up, correct?

A. Those switches are for the purposes of setting bonus levels, et cetera. And the software does not respond to those, the way it is programmed at the moment.

Q. And so for practical purposes, as far as those switches are concerned, it's like they are not there, as far as the software is concerned. Correct?

A. That is not correct.

As the program reads through, okay, it attempts to read -- it reads the switch input line there, and it will not change the operation of the game, is the only point.

Q. You say it reads it but it doesn't do anything about it.

A. That's correct.

Q. Now, are those the switches, these on the left-hand side, that are provided with the diodes?

A. That is absolutely correct.

Q. Now, how about these switches on this side of the playfield, on the right side, the switches that have to do with the playfield action?

A. The switches on the right-hand side of the matrix that correspond to switches in the playfield do not have individual diodes in series with each switch for steering purposes.

Rather, each group of 4 in the columns has a single diode.

Q. Now, you do recall the arrangement of the Bally games, do you not?

A. Yes, sir.

Q. Do those Bally games have isolation diodes on each of the switches?

A. Yes, sir, they do.

Q. On the playfield?

A. Yes, sir.

Q. They do?

A. They do.

Q. How about the Gottlieb games, does that game have isolation diodes in connection with each of the switches on the playfield?

A. Each of the defendants' games has switches on the playfield for all those, as is disclosed in the patent.

Q. You said switches, Mr. Schoeffler. Do you mean diodes?

A. What I meant was, each of the switches has a diode in

each of those games, as is disclosed in the patent.

Q. Let's just pursue that a moment, Dr. Schoeffler. We'll go back to Fig. 5 of the patent.

I believe you identified those isolation diodes as 98, correct?

A. That is correct, sir. That is a representative diode, and is so indicated in the text of the patent.

Q. And there is in fact a diode in the Flicker machine in that position, is there not?

A. No, that is not correct, sir.

The diode on the Flicker machine is in the columns of the matrix.

That switch is in a row of the matrix, and it's shown one for each switch in that row. If it were in the column, it would have to be drawn differently.

Q. So then are you telling me that this diagram, does this conform to the Flicker machine or does it not?

A. This shows more diodes than are in the Flicker machine.

What it teaches is that if you need -- have sneak paths -- notice the way it is drawn with all the switches apparently present in a very general scheme -- that you should put diodes in series with all of the switches, is what that teaches.

In the Flicker machine it wasn't necessary apparently to do this, in Frederiksen's analysis, and so he did not.

But he did indicate that it should be done when it was necessary, and was done in the machine where it was necessary.

Q. Now, Doctor, he never showed diodes on each of the switches.

A. He discloses diodes on each of the switches right there in the patent, and in the text of the patent.

Q. 98.

A. If you read in the patent where it says 98, it says these are representative.

And the way this is drawn, in series with each of those, that's the only way an electronic engineer of the day would interpret that. Steering diodes were known at the time this was produced.

Q. So it's your testimony, Doctor, that, for example, the diodes appearing in Exhibit 52 at P-4 of the playfield, are those the diodes 98 shown on Fig. 5?

A. Those are not, sir.

Q. Where are these shown on Fig. 5?

A. These diodes are not shown on Fig. 5.

Fig. 5 shows the general case where you put the diode in series with each switch.

What was done in Flicker, because of his arrangement of switches on the right-hand side of the matrix, and the fact that they couldn't close and produce sneak paths, he

did not need diodes for sneak paths through the switches.

Those diodes prevent sneak paths, however, through the lamp circuits.

Q. Let's talk about the switches so the Court understands what the sneak path is.

If on Exhibit 13 the switch I've indicated as 1 is closed as a valid closure --

A. Yes, sir.

Q. If Switch 2 is stuck, and if Switch 3 is an outhole switch or some switch in which the ball is residing, what will happen?

A. If you are referring to --

Q. Without the diodes present.

A. If you are referring to the Flicker game, the combination of the switch numbered 13 and the switch numbered 22 being closed at the same time should not occur.

Q. With 12 being stuck at the same time.

A. Yes.

In the Flicker game the only switches that can be active are in the right-hand part here. And as Frederiksen testified, that normally they do not close simultaneously.

Q. I understand that. Just so we understand what the sneak path is, if Switch 13 that I've marked 1 is closed --

A. Um-hum.

Q. -- Switch 12, which I've marked 2 is stuck closed --

A. Um-hum.

Q. -- and Switch 3 is also closed, what happens?

A. Not referring to the Flicker, because it doesn't occur there readily, but in general if one has no diodes in the matrix and multiple switches like that in that shape of an L as you have indicated, one could misread an open switch to a closed switch on the bottom line there.

Q. And there would be a sneak path. That's what you're referring to as a sneak path, correct, Doctor?

A. Yes. A sneak path results in reading a switch that is open as though it were closed. And so it would be an error then as far as the operation of the game were concerned.

Q. And the game would not be functioning properly, correct?

A. That switch would be read erroneously. The effect of the closure of that switch may make the game operate ineffectively, it may be something that goes unnoticed. But in general that is an error in reading that switch.

Q. Now, with respect to switches, your testimony earlier was that such isolation diodes in connection with each switch are necessary.

A. My testimony was they are necessary when sneak paths can arise.

And in the patent, where you're describing the general way to do this, they are shown.

Now, my testimony also was that, in the case of the Flicker machine on the right, it was Frederiksen's judgment that the sneak paths could not occur, and therefore the switches were not empty.

And that, furthermore, if he thought that they would occur, it would have been easy to modify the placement in the matrix, because there's plenty of space to do it; or he could have put in the diodes himself, because he did put them in on

the other switches.

Q. The fact of the matter is, is that those diodes are not present on any switches that are software operated in the Flicker, correct?

A. No switch is software operated, sir. They are read by the software.

Q. There is no -- let me put it this way: There are not those isolation diodes associated with the individual switches that make a difference in the operation of Flicker.

A. That is not correct, sir.

There are diodes on the parameter adjustable switches that are implemented and that do make a difference, namely that 5-ball switch in that column about the matching straight.

And that is why Frederiksen put them there, because if the operator closes those, those are closed all the time. And consequently it would be possible to have a problem with those switches.

Q. You say it is implemented on one switch, the 5-ball straight switch?

A. Yes, sir. Let me get the schematic out.

Did you want me to point those out to you, sir?

Q. Yes. I want you to point out over here, which switches on the mux chart.

A. I'm looking here on Plaintiff's Exhibit 52, which is the

schematic for the Flicker game.

And you'll notice that on that exhibit, in the upper left-hand corner where it shows the connection for the 5-ball, it shows a diode in the line going to mux 9, which is the column that the 5-ball switch is in.

You will also notice diodes in the extra ball, jumper, straight, add-a-ball, replay match circuitry, which is just below that on that same exhibit, sir.

Q. But the operator adjustable switch is here.

A. Those switches are implemented by -- if you recall looking at the board, there are some wires, colored wires, yellow, red and I've forgotten the other colors, sticking up in the air.

Underneath there there is a diode in each of those wires. So if any one of those was plugged in, there would be a diode in every single circuit of those adjustable switches, as Frederiksen taught in the patent.

See, those could contribute significantly to sneak paths.

Q. Well, now, Frederiksen never mentioned sneak paths in the patent, does he?

A. Frederiksen mentioned the steering diodes in the text and showed them on the diagram. That's inherent in the patent.

Q. Frederiksen never mentioned sneak paths in the patent.

A. The word sneak path does not appear in the patent.

But the disclosure of the steering diodes is very clear in the patent.

Q. Now, you just referred to Exhibit 52, and in referring to the match, replay, add-a-ball, and straight, you talked about switches, didn't you?

A. That's a selection that is implemented with a plug-in switch.

Q. Are they switches?

A. Yes. It's a connection that one plugs onto the columns there on the back of the board, sir.

Q. It is a wire one takes off one location and places in another location, correct?

A. To complete an electrical circuit, that is the definition of a switch.

Q. It is not a switch in the same context of the switch that can be opened and closed rapidly by activation, correct?

A. Parameter adjustable switches are never designed to be rapidly and continuously changed.

They are designed to be set up to specify how the game is going to play, and that stays there all the time.

So one would not implement that in a pinball game where economics are important with an expensive mechanical switch.

Q. Mr. Frederiksen testified at 494:

"In the full schematic there is a diode

attached with each switch" -- referring to the Flicker game --

"and there is a diode similar to 98 that would be on the short wire going over to the columns, which in this particular drawing there was no real room to include."

Now, your testimony is, that is not true with respect to the playfield switches. Correct?

A. My testimony is that, as shown on the Flicker schematic, this is correct as best I can determine; that is, the diodes that are here are exactly what are underneath that playfield.

Q. So you're saying that Exhibit 52 is correct.

A. Yes, sir, that those diodes are all present.

Q. Those diodes are, but there are not diodes in connection with each playfield switch?

A. There are not diodes in connection with each playfield switch. The diodes shown on this exhibit are correct.

Q. Sneak paths could exist as I have illustrated on 11-3 on the playfield?

A. That I do not agree with, sir, that if one were to deliberately take the glass off the Flicker machine and hold several switches closed, you could create a sneak path. But as Frederiksen indicated, because of the concurrency of those switches, the fact that the spinner switch is in a column by itself precludes it being included in a sneak path. Because of the way the switches fail -- they do not fail closed, it is a very unlikely thing. Consequently, he did not need diodes to solve a problem he did not consider real.

Q. Let's talk about that they do not fail closed.

There are a bunch of roll-over switches up here on the Flicker game. Do you remember these?

A. Yes, sir.

Q. How do they fail, closed or open?

A. The roll-over switches --

Let me change my response, if I may, sir. I do not personally know how that would close. My only knowledge -- or how it would fail.

My only knowledge of how the switches fail is based

on Frederiksen's testimony, and apparently he had experience with the vertical switches only, which were the only ones he has mentioned as not likely to fail closed.

He did not mention the other. So I assume they could fail closed, but I do not know myself.

Q So all of these switches, which the ball runs over, at least it is your tentative opinion, could fail closed, correct?

A. Yes, sir.

Q. If they failed closed, they could create a sneak path, correct? They could create a sneak path, Doctor, correct?

A. Only if you had at least 2 failures in the system.

Error recovery in a game like the Flicker does not require it to have the same level of error recovery as the NASA shuttle, but you would have to have at least 2 switches fail in order to have a sneak path in that game over there, as I read this diagram.

Q That is right. With that failure, you have a sneak path, and that could be remedied with diodes, correct?

A. If he had put diodes in those switches, then no sneak paths would have been possible.

Q. Bally put diodes on those switches, correct?

A. They did, and so could Frederiksen if he had thought it was a problem.

Q. All right. Let's talk about Exhibit 52 otherwise, Doctor.

In Exhibit 52 there is something that mystifies me, Doctor.

You said the exhibit was correct, and are you persuaded it is correct in all aspects in the way it reflects the Flicker game?

A. There is a -- something not shown on this exhibit, this wiring diagram, that is on the solenoid that pulls in the flippers. There is a fast closure circuit that is not shown here. That has nothing to do with the invention, but that is different here.

Let me just look this over again to see if anything else --

Q. Let me call your attention --

MR. SCHNAYER: You interrupted him. He was answering a question of yours.

BY THE WITNESS:

A. (Continuing) I was just going to scan quickly to see if anything else comes to mind.

That fast pull-in circuit is the only one that comes to mind.

Q. Just so we can understand how to read this --

A. Yes, sir.

Q. P4 is the playfield plug, correct?

A. That is the plug that goes down to the playfield, that is correct, one of the plugs.

Q. It indicates that mux line zero goes through terminal 1 to terminal 2 on P2.

A. That is what it says on the diagram, sir.

Q. Is that what happens?

A. I did not trace the wires on the board. I was afraid of stopping and hurting the machine.

Q. It also shows that plugs 2, 3, 4, 5, 6, 7, 8 of the playfield inputs go to Plug P2, correct?

A. That is right, and they connect there to Mux zero through -- there are 7 of them. So that would be Mux zero through 6.

Q. Correct.

A. And Mux zero through 6 are the columns of the matrix.

2,2

Q. Mux zero through 6 are columns of the matrix. So one would indicate that these wires go up here, correct?

A. That is what this diagram says. I did not trace them, though, sir.

Q. But what I want to point out to you is down in Plug No. 1, there is this transistor. You call this the slow turn-on or the low Beta transistor.

A. No. That is the slow turn-on transistor. It also happens to be low Beta.

Q. The slow turn-on transistor, from this location, drives the lamps, correct?

A. That is correct.

At the top of that transistor, it is labelled Mux zero to F, and those are the drives for the columns of the matrix, that is correct.

Q. It says, "Mux drive zero down through F," correct?

A. That is correct, and the title, Mux drive, on the left is the same one that is used on the CPU schematic to indicate the output of the decoder.

So those are consistent names. Mux drive is different from Mux zero to F.

Q. Now, the lamps and the digits are then driven through the slow turn-on transistor, correct?

A. It is my understanding that the lamps and the digits and the columns, also, of the switch matrix go through that

transistor, sir.

Q. I know, but this diagram does not show them going through that transistor, does it?

A. This diagram does not show anything going through that transistor.

If you will notice, there is nothing connected to the top but a label Mux zero to F -- there are no lines coming out of it. But wherever something attaches to it, you indicate Mux A, Mux B, Mux 1, et cetera, to indicate an implied connection.

If this drawing is correct as to the actual wiring, the upper left on the P2, it has a consistent designation there, also, Mux zero through Mux F.

Q. Now, have you traced the diagram, the wires here?

A. No, sir. I did not trace the diagram or the wires.

Q. Do you know whether or not there were jumper wires going from here to P2?

A. No, sir. I did not.

Q. In this typical arrangement --

A. Yes.

Q. -- as reflected by 52, couldn't this arrangement also indicate a machine that had 2 matrices, one for the switches and one for the lamps and digits?

A. How do you draw that conclusion, sir?

Q If we have one driver here, if the digits are driven off a decoder through P2 and from the decoder signal without being driven by the slow turn-on transistor?

A It would be feasible to build such a machine, but the way this diagram is drawn is at most ambiguous.

We know from the software in the machine that there is only a single matrix because there is in the key loop that enables the columns for the lamps, the digits and the switches, there is only one decoder enabling one column.

So the answer is there are not two matrices in this case.

Q My point is this diagram is ambiguous as to the existence of one or two matrices, correct?

A No. The only thing that is ambiguous is the fact that those lines are shown connected up here on the plug P2. They are correctly labeled for a single matrix system.

Mux zero is the proper label for the connection for those switch lines.

Q So then is it your testimony that on the Flicker machine, the collector of the low data transistor is connected to the left-hand side of plug P2?

A Unfortunately, I did not trace the wires for fear of loosening them, and all I can testify is that the labeling is correct. They should be wired that way so that they go through in a single matrix, and that is totally consistent

with the operation of the program and no other operation, no other connection, is consistent with the operation of the computer program.

So in my opinion, I cannot see how it could be done any other way.

Q Well, suffice it to say, if there were jumper wires going up from the right-hand side of P1 to the right-hand side of P2, wouldn't that be an unusual way to wire the machine?

A No, sir.

In bringing these connections together, remember, for this we have lamps, digits, and switches all in the machine. We need lots of places to connect the wires, and so that is just the sort of thing someone who is wiring the machine might have done for convenience.

Q Well, I ask you to consider this because I have looked at this diagram a great deal.

The arrows on P2 are shown coming out from the logic board, correct?

A They are, sir.

Q Is that correct?

A I have no idea. I did not trace the wires on those boards for fear of loosening them. So I do not know whether those wires are even there or whether anything is even connected to that plug P-2.

All I know is that on this diagram the labeling is consistent, but the actual operation of the machine is determined by the software.

Q Dr. Schoeffler, did you find in your inspection of the Flicker machine any cut wires in the back?

A In looking at the driver board, there is a resistor that I associated with that fast pull-up circuit for the flipper solenoid that has been cut. That is the only one I noticed.

Q That is the only wire you saw cut in the back of the Flicker machine?

A That is the only one I noticed cut, yes, sir.

Q Well, would you come back with me? Let me ask you about certain wires back there.

I have a picture of the -- you might have to inspect it yourself.

MR. SCHNAYER: Has that been marked as an exhibit?

MR. LYNCH: No.

Can we get in the back of the machine?

MR. SCHNAYER: I think the --

MR. GOLDENBERG: Marty has the key.

THE COURT: The key to what, the machine?

MR. SCHNAYER: The back box of the machine.

MR. TONE: The key was delivered to the clerk, your Honor.

MR. SIEGEL: It is apparently in Marty's front drawer. I saw him take it out.

MR. LYNCH: We can handle it later then. Maybe I can handle it over the break.

BY MR. LYNCH:

Q Let me ask you this in connection with your testimony, Dr. Schoeffler.

You discussed men of ordinary skill in the pinball art and men of ordinary skill in the digital electronics art, do you recall that?

A Yes, sir. I do.

Q You referred to Mr. Norm Clark as a man of ordinary skill in the pinball art, correct?

A Yes, sir.

Q You said he was a man of electromechanical abilities, an electromechanical logic engineer, right?

A Yes, sir.

Q He would not understand very much about software, being able to read software, would he?

A Software, reading software?

Q Reading software listings.

A I considered it unlikely that the average person with his background would have been familiar with computer software, yes, that is correct, sir.

Q Now, would he have been a person who would have appreciated to your point of view all of this inferred and inherent disclosure of the 441 patent?

(Brief interruption)

BY THE WITNESS:

A If you are referring to the kind of engineer who is not the kind we have used the term, digital logic designer, for, but one that had been designing electromechanical kinds of things without electronics of any type up until that time, he would not be familiar with computer programming.

And, in particular, he would be less aware, less appreciative, then of the problems of making a device as complicated as a microprocessor controlled pinball machine operate in the noisy environment in which it operates.

Q So it is your testimony, and you will agree with me, that Mr. Clark is not the person that could have read the Frederiksen disclosure and understood all these inferred and inherent matters that you have testified about, correct?

A I have to qualify that. I am not actually certain other than what Mr. Clark said in court about his background, but I would agree with that, for the typical engineer who had no exposure to microprocessors and electronics.

The typical -- if such an engineer had moved into the electronics field and learned the microprocessor art, then coupled with his background in the pinball art, he would have been able to read the patent and learned how to build a controlled pinball machine. But he first must learn some electronics.

Q Well, at page 1393, you testified you had an understanding concerning the level of ordinary -- I think is what is meant -- skill in the pinball art prior to 1975, correct?

A I do not recall the precise words that I --

(Brief interruption)

A Yes.

BY MR. LYNCH:

Q On the next page you answered, "Based on the testimony of Mr. Clark"?

A Yes, sir. And what I was not certain of is whether you were asking about Mr. Clark himself or the people he was talking about in his testimony.

Q I did not ask. Mr. Schnayer asked.

A No, sir. In the question you just asked me, you used Mr. Clark's name.

Q Well, based on the testimony of Mr. Clark then?

A He was testifying about other people in the art.

Q Would you say that the ordinary person in the pinball art prior to 1975, the ordinary person about whom you have testified here, whether that ordinary person would have been able to appreciate all the inherent and all the implied and all the inferred aspects that you have testified about in connection with the '441 patent?

A By the word, ordinary person in the pinball art, you must qualify that. As described by Mr. Clark, these were

people who were not -- who do not have a digital logic background in computer programming. And in that situation, they would not be able to read about microcomputers and microprocessors without some prior work.

Q So then it is fair to say that the '441 patent is not directed to Mr. Clark or to the people about whom he testified, correct?

A It is fair to say that for those who have no digital logic background or electronic background or computer programming background.

Q Similarly, it is not directed to a man who only has digital background, electronic background, but no computer background, correct?

A That is not so true. At that point in time, the typical digital logic designer in '72, let's use that year, did not have much computer background at all.

But that is the time of the introduction of the microprocessor, and they were acquiring it rapidly through the kinds of short courses, vendor supply courses, that I described previously in my testimony.

Once one of those men had acquired a knowledge of, for example, the 4004 microprocessor and programming, then this patent would have been quite readable by him, and he would have been able to understand how to build a microcomputer controlled pinball machine following Frederiksen's

and Nutting's specifications.

Q Yes, but that was a person who both had digital random logic experience and had exposure to microprocessors, correct?

A When the understanding would come to such a person, he would have to understand the microcomputer in order to build the device.

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Q. And in order to read the patent, correct?

A. He must also understand English, because that's what the patent is written in.

But the patent includes the program, so he clearly must go and study the microcomputer 4004 manual so he understands the computer, so he can literally read the langauge itself.

But then he can understand it with no problem at all.

Q. So then the person of skill to whom this '441 patent is directed is a person who has digital random logic design experience, correct?

A. Is that the end of your question, sir?

Q. No, but he must have that, must he not?

A. He must understand electronics in general, digital logic, that is correct.

Q. And he must be able to understand, have a basic working knowledge of microprocessors, correct?

A. He must be willing to acquire that in the process of reading the patent, that is correct, sir.

He must also have a manual so he can look up terms and things of this nature.

But the digital logic designer certainly had that capability of doing that. It's just that prior to '72 they weren't accustomed to doing that.

This was a new technology which was sweeping in very, very rapidly, and everyone was talking about it revolutionizing the field.

And so these people would then go to these courses, they would learn this, and then he could read the patent and build it.

Q. But before he finishes the patent, he has to understand microprocessors, have a basic working knowledge of it, correct?

A. He must understand what a microprocessor is, of course. The invention involves a microprocessor-controlled pinball game. He at least has to know what the word means and what its impact is.

Q. All right. NOw, you also indicated, Doctor, when you were talking about the constraints on Mr. Frederiksen, that he had to operate within the constraints that pinball designers had previously operated within. Correct?

A. I don't recall my exact testimony.

But I believe I was referring to the constraint that he not be able to go into the machine and change the basic hardware, such as the quality of the switches that the ball hits, or other devices like that.

And that he had to design using essentially the same inexpensive, unreliable components that were used in the past.

Q. Do you know if they're using the same quality switches

today in pinball machines, or, as of the time that pinball reached its heyday, microprocessor pinball reached its heyday, do you know if they were using the same types of switches as they were using in the old electromechanical games?

A. I do not, sir. I was basing that on Frederiksen's testimony.

And that was most relevant, because at the time he was inventing this invention, he clearly was using the same switches because he took a standard electromechanical pinball game and converted it.

And so that was the constraint that led to his -- that he lived with in making his invention.

Q. Do you know whether or not Bally and all the other pinball manufacturers, when they went to microprocessor-controlled pinball, used the same kind of switches?

A. I do not know that of my own knowledge.

Q. Do you know whether they went to gold-plated switches?

A. I do not know that.

Q. Why would someone go to a gold-plated switch, Dr. Schoeffler.

A. Gold-plated -- gold --

Q. With gold-plated contacts. Not the whole switch.

A. Gold-plated contacts are used in environments that are corrosive and where the switch has to conduct very small current.

Q And so do you know whether Bally in fact uses gold-plated switches?

A In their later machines?

Q Yes.

A No, sir, I do not.

Q Do you know whether Gottlieb did?

A I have no idea,sir.

Q Do you know whether Williams did?

A I have no idea, sir.

Q Did you read the manuals?

A I read the manuals, but I paid no attention to that, if it's there.

Q I show you the Cleopatra manual, Exhibit 10-C of defendants.

Read the warning in bold type on page 11.

A "Do not file, burnish or in any way abrade gold-plated switch contacts."

I did not consider it significant to the invention, sir.

Q Well, it is a fact, is it not, that the pinball -- if indeed gold-plated switches were used, the pinball industry adapted itself in that respect at least to microprocessors, did it not?

A Once an invention like this has been produced and shown to be economical, one would expect lots of things.

And we know there was a dramatic change in this industry in the switching over from the electromechanical to the electronic. And so one would have expected lots to happen.

At the time of the invention one is not certain in advance before it is successful, you know, whether it's going to be successful, whether the economic margin is going to be such that you can improve the components and the like.

Frederiksen very carefully and clearly testified that he did not know. And what he wanted to do is take an existing electromechanical pinball game and demonstrate that you could use a microprocessor to control it. And he did that very successfully and very elegantly.

As time went on and the technology changed, evolutions like that are exactly what one would expect.

And one would expect today that pinball games might even have television displays on them in addition to the lights and the digits and the lamps.

But that's the normal evoluation of technology.

Q Well, let me ask you this, Doctor, just answer -- if you will answer the question.

A All right.

Q The successful games, it would appear, Doctor, all had gold-plated switches on them.

Now, if the successful games had gold-plated switches on them, what did the pinball designers seek to solve as a problem by using gold-plated switches?

A I don't know of my own knowledge that all successful pinball games have gold-plated switches, nor do I know precisely what problem they were solving.

Q So you don't know if the implementation of Flicker is, in that particular aspect, the implementation that was successful and that, as you put it, revolutionized the industry, do you?

A Well, I know Flicker ran for ten years, and so that operated correctly.

If other enhancements were added to the switches for some reason, I do not, actually do not know of my own knowledge what that is or why it is; that is simply an addition to the invention that perhaps improved the performance or the life or cut the maintenance cost.

That's the normal way one uses new technology as one gains experience.

Q Now, tell me this, Doctor: What advantage does it give

the electronics engineer to use gold-plated switches instead of the ssitches that Mr. Frederiksen used?

A The only one I know of is when the switch is conducting very low currents, to cut down arcing problems and the like.

And so I do not know what the advantage is in the pinball game.

Q Arcing is noise, right?

A No. Arcing is a discharge of electricity through the air, and when it occurs it can produce noise. It is not noise itself.

Q Okay. Arcing -- gold-plated switches also will prevent corrosion of switch contacts, correct?

A In general, especially in different atmospheres one uses higher quality metals to prevent corrosion, that is correct, sir.

Q And corrosion is one thing that leads to stuck switches, correct?

A That is correct, sir.

Q So gold-plated switches would also tend to -- tend less to stick than ordinary switches, wouldn't they?

A All other things being equal, that is true.

And for that reason I would have expected, if that's the reason they went to them, that they would have appeared in the electromechanical games, where there was a much more severe switching of currents through those relays.

And so that's why I do not know of my own knowledge why later on. It could be simply that the cost of such switches came down, okay, and they would have been used earlier.

I have no idea what the reason is. I'm just conjecturing.

Q Well, has the cost of gold come down, in your knowledge, Doctor?

A I said the cost of gold switches.

Q You also testified about infringement, Dr. Schoeffler.

A Yes, sir.

Q If I may, to keep all these things in mind: you testified from Exhibit 419, didn't you, which was an accumulation of material about the Gottlieb machines, the Cleopatra and Spiderman, correct?

A That is correct, sir.

MR. LYNCH: Do we have a copy of 419 for the Doctor, please.

BY MR. LYNCH:

Q Referring once again to the item of the gold-plated switches, you also distinguished the calculator art; you said the calculator art really had nothing to do with the pinball art, because they use special keys.

Do you remember, do you recall that testimony, Doctor?

A Not precisely, sir.

Q Well, you differentiated between calculator keys and pinball playfield switches.

A Oh, yes, sir. I'm sorry. Yes, I do recall now.

Q The use of gold-plated switches makes the switches on the playfield a little bit more special, doesn't it?

A It makes them different.

Q Different from the things that Mr. Frederiksen used.

A Yes, sir.

Q Okay. Doctor, you testified about the Cleopatra and the Spiderman game, and you came to the conclusion that both infringed the patent.

A On a claim-by-claim basis I found claims that read on both of those machines, that is correct, sir.

Q Now, I would like to keep in mind what we have here. I'm going to make a chart where I'd like to compare the Flicker game on the one hand, the '441 patent on the other, Cleopatra on the other, and Spiderman as a last item.

Now, insofar as you're concerned, Doctor, do you regard Flicker substantially the same as the '441 patent, or do you know?

A It's my opinion that the '441 patent, as you call it, reads on Flicker.

Q I understand that. Let's talk about the detailed circuitries: did you ever make a detailed comparison?

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A The substance is the same.

Q Let me call another thing to your attention, just as a matter of interest.

In this device, the decoder that operates the solenoids is shown operating the ...

A The optoisolator.

Q -- the optoisolator that works the coin acceptance.

A That is correct, sir.

Q. Do you know if that is the way it works on Flicker?

A. I do not believe that's the way it works on Flicker, but I did not trace the wires to be sure.

Q. And in fact, if this were the way it worked, the way it works on Flicker, you wouldn't be able to take coins at any time that the solinoids were being activated?

A. No, that's not true, sir.

Q. Well, if they were being activated for any period of time.

A. No, sir.

The way those optoisolators work, that if you hit them periodically, they stay warm for a time which is very long compared to the closure time of solenoids.

And you'll notice that in the patent where Frederiksen disclosed that idea, that he has that in the bottom line of that top decoder, which is the rest position.

In other words, when nothing else is being done, he's constantly bombarding or hitting that optoisolator to keep it hot.

So in my opinion there would be no problem with using that. But I have the impression that it was not used in the Flicker game. I don't know why.

Q. That's not the way it was implemented in the Flicker game.

A. That's my impression.

Q. Let's go to what we're talking about as comparing these devices.

The Flicker game itself -- the first thing I want to talk about is whether it has a single matrix.

Does the Flicker game have a single matrix?

A. It's my belief it has a single matrix, sir.

Q. Does the '441 Patent disclose a single matrix?

A. In the preferred embodiment it discloses it. But it also calls for multiple matrices.

Q. Well, it never says that. Now we're getting inherent, again, right, Doctor?

A. No, sir.

The initial reference to matrix multiplexing clearly does not exclude multiple matrices. And then it goes on to a specific case where there is one.

The claims further, when the claim, for example, Claim 46 refers to a single matrix, it is a narrowing of Claim 5 which does not. And so multiple matrices are clearly called for in the '441 Patent.

So I would not agree with a "yes" there.

Q. I'm not saying what it excludes. I'm saying what it shows, the circuitry it shows.

A. The preferred embodiment in that figure shows a single matrix. The patent teaches multiple matrices.

Q. It never explicitly teaches it. It only doesn't exclude

it. Correct? Just so we understand each other, Doctor.

A. It explicitly teaches it in the claims by claim differentiation, if that's the proper term, between 45 and 46. That's the only way to read those, and so that is explicit.

Q. We can get to claim differentiation later.

A. All right.

Q. Answer this question, Doctor: Does it ever say explicitly "You may use more than one matrix"?

A. The patent doesn't use words like that for anything, sir.

But it does not specifically anywhere use the exact words that you have just quoted.

Q. It never suggests explicitly 2 matrices, does it?

A. On the contrary. Because of that introductory part, it indicates in the preferred -- it does not exclude them.

Then in the preferred embodiment, the justification for the single matrix is rather carefully established. Notably, because of the limitations of the 4,004, the ability to, for example, time offset can be done this way, whereas it would be more awkward or at least different if multiple matrices were there.

They are not excluded.

Q. I didn't say they were excluded.

It nowhere explicitly says two matrices.

A. The words "two matrices" are nowhere explicitly written.

Q. Let's talk about the disclosure of the '441 patent.

A. The preferred embodiment?

Q. Yes.

A. All right.

Q. I want to talk about this. (Indicating)

A. All right. Why don't we label it as such, then, to differentiate it from the patent as a whole.

Q. "'441 device."

A. Why don't we say "preferred embodiment."

Q. "Embodiment." I'll put "Embodiment for '441."

A. Thank you.

Q We'll say that a single matrix is disclosed there, correct?
A In the preferred embodiment, yes, sir.
Q What does Cleo use?
A Cleopatra uses two matrices, sir, one for the switches and one for the digital display.
Q And the lamps aren't even matrix multiplexed, correct?
A The lamps are not matrix multiplexed in Cleopatra, that is correct.
Q So we have two matrices, and excluding lamps. Correct?
A That is correct, sir.
Q Likewise for Spiderman?
A Correct.
Q I'm just going to draw an arrow over, indicating that's similar for Spiderman.

Let's go to the next aspect, that is, cyclic and sequential operation of the switch scan.

Let's talk about the switch scan in each instance.

How is the switch scan accomplished in Flicker?
A May I move the figure 5 out of the way a little bit?
Q I'm sorry.
A And would you repeat the question. I'm sorry.
Q How is the switch scan in Flicker accomplished? Is it accomplished cyclically and sequentially?

A The switch scan is cyclical and sequential.

Q And that means that the microprocessor goes through those 16 mux lines and then there's one line at the end, I believe, and then comes back and strobes them again, correct?

A That is correct. Cyclical and sequential for switches implies that you do not miss switch closures.

And so when you are looking for a switch to close, you have to look at each of the columns over and over and over again.

Q And another reason that Mr. Frederiksen testified he kept that in Flicker cyclic and sequential is because he didn't want lamp flicker, correct?

A In the single matrix implementation that Frederiksen had, he needed to keep the lamps hit on an even basis so that they would not flicker, and so that they would all be of uniform brightness, also.

And so since the switches are in the same matrix, the scanning most of the time is the same, but not all the time.

Q Well, he discloses cyclic and sequential scanning.

When is it not cyclic and sequential?

A Whenever in the Flicker game that he is going out and doing a routine that is long in computation, all right, so that for example he is away from the multiplexing routine, he goes back and periodically does a multiplexing column,

but that does not include the reading of the switches.

Q And that's the period we talked about at the end after he goes through all sixteen columns, correct? He has one period at the end --

A The long routines are all done when he does that. But during that time he does insure that the lamps stay lit properly and that the test -- I'm sorry. I mis-spoke.

The test line of course is tested during that time.

Q So he has to make it cyclic and sequential to be sure he doesn't miss switches and to be sure the lamps stay of the same brightness and don't flicker, correct?

A That's correct, sir.

Q That is likewise the case in the embodiment of the '441, correct?

A That is correct, sir.

Q Now, how about Cleopatra, how is the switch scan accomplished in Cleopatra?

A Cleopatra and Spiderman differ in a significant way, or in the following way from Flicker, which reflects on that: namely, the use of an -- Let me back up. I'm sorry.

The switches in Cleopatra are organized into an 8, a set of 8 columns instead of, as in Frederiksen's 16. And they are scanned cyclically and sequentially.

Q Now, they're scanned cyclically and sequentially when no one is playing the game, right?

A Whenever one -- whenever Cleopatra is looking for a closed switch, it constantly scans cyclically and sequentially. That's while someone is playing the game, it does that also.

Q Well, your testimony on this, I believe, Dr. Schoeffler -- I believe you testified that while it's strobing, it's strobing cyclically and sequentially; but when it's out doing other things, it interrupts that strobe. Correct?

A When it is out doing other things?

Q When it is keeping score, when it is doing other things.

A When there is no need to scan the switches, it does not, that is correct.

For example, immediately after a switch closure, you have to respond to that switch, and then it goes off and does another routine. That is correct, sir.

Q Now, let's assume there's a switch closure in Cleopatra. Okay?

A Yes.

Q And let's assume we're using 11-E, just for demonstration, that switch 22 in 11-E closes.

A Yes, sir.

Q And we come and see that.

A Yes, sir.

Q What happens in Cleopatra? Do we continue the scan?

A We go off and process that switch. And then when we're through with that, we re-start the scan, the next time we scan.

Q We start where?

A At the beginning of the matrix again.

Q You start at the beginning of the matrix again.

A That is correct, sir.

Q Now, that would mean that in Cleopatra, the way it is arranged, it's possible that we will never get to switch 23, correct?

A No, sir.

Q Well, I would like to ask you to refer to Mr. Harmer's testimony on the issue.

Mr. Harmer's testimony is in 419, the exhibit you have, pages 136 and 137 of his testimony.

Now, Mr. Harmer was a Rockwell engineer who was familiar with the design of Cleopatra. Isn't that correct?

A That's correct.

Q Now, Mr. Katz asked the question --

A Let me finish the page, if I may.

(Reading document)

I'm sorry. I finished it now, sir.

Q Mr. Katz asked the question:

"How is it possible then to be sure that all the play field switches" -- and it means on Cleopatra -- "which are required to be sensed will be sensed because of the theoretical possibility that a switch scan might not be completed?"

Answer on the next page:

"THE WITNESS: There is no guarantee of not missing switches in any number of situations."

Did you read that?

A Yes, I did.

Q Do you believe that?

A I believe he must have known what he was talking about, and so I accept that, sir.

Q So there could be situations where indeed you miss switches in Cleopatra, because you don't finish a scan. Correct?

A There are situations where that may occur now and then, that's correct, sir. He said so.

Q Now, that would mean that one of the purposes of the cyclic and sequential operation of Frederiksen is not fulfilled by Cleopatra. Correct?

A In the design of the control system for a pinball machine, one reduces it to a degree so that it will work practically.

If Cleopatra was missing switches every second, you would not be able to play the game.

If, now and then, because of some fast action of the ball, a switch were missed, it probably would not be noticed.

If it were noticeable, it would not have been a successful game, in my opinion. So I don't see that that is a difficulty.

Q Well, I just want to talk about the designer's philosophy here.

A Yes, sir.

Q The operation of Cleopatra is interrupted, and not cyclic and sequential. Isn't that fair to say?

A No, sir.

I would call the scanning in Cleopatra cyclical and sequential.

Almost all -- recall that when the ball is moving around the playing field, 99 per cent of the time the ball is not in contact with anything. When it hits a switch, it's in contact with it for a few milliseconds; we pick it up, respond to it, and then we're looking again.

So almost all the time it is cyclically and sequentially scanning.

Now, when something happens so that we know, for example, it is unlikely for another switch to be closed, because I've just detected this switch to be closed, there's usually no need even to scan the switches.

Or, if I'm deliberately turning off the scanning because I know I would misread it.

And that does not violate the spirit or the description that Frederiksen gave in the patent, namely, you cyclically and sequentially scan so you don't miss switch closures.

Q But you just read testimony where there was no guarantee in the Cleopatra that you wouldn't miss switch closures.

A There is no guarantee in any machine that you will not miss switch closures.

Q Your testimony then is, is that Cleopatra is cyclic and sequential, as you testified on page 1251, most of the time, scanning through, finding no switches are closed. Correct?

A That is correct, sir.

Q Now, we had a discussion early on that cyclic and sequential, does it mean anything to add "sequential" on to "cyclic"?

A It means quite a bit in the specific embodiment described in the patent, because the switch and the lamp matrix are together, and so one is constrained in the way you scan the switch columns by the need to keep the lamps the same brightness.

So, yes, sir, the word cyclical means a set of events which recur; the cyclical in the patent refers to the fact that you have to do them in order so the lamps are all the same brightness.

That would not, incidentally, be the same constraint once we move the switch matrix out of the lamp matrix.

Q So Cleo doesn't have the lamps in a matrix, so the second reason to have a cyclic and sequential scan, that is, to keep the lamps of uniform brightness and to keep them from flickering, wouldn't be present in Cleo. Correct?

A That is not correct, sir.

The lamps are irrelevant here. The things that are matrix multiplexed are digits, and those have to be cyclical and sequential so that they stay the right brightness.

Q I understand. But the lamps you don't have to worry about.

A The lamps are not matrix multiplexed in Cleo, in Cleopatra, that is correct.

Q. So you don't have to worry about them.

A. The designer had to make sure the lamps were turned on properly, so he worried about them that that design was proper.

You must worry about them from a noise point of view. You do not have to worry about them from a cyclical and sequential matrix multiplexing point of view, because they're not multiplexed.

Q. Now, my question is this: If we go through the matrix in Cleopatra and we strobe it and are interrupted and go back to the beginning, is that cyclic?

A. The scanning of that switch matrix is cyclic and sequential.

Q. It's cyclic and sequential even though we go back to the beginning every time we detect a switch closure?

A. Now and then that happens. A very small percentage of the time.

And when it happens we are in a situation where usually we know we do not have to scan.

So the invention does not have to carry the connotation that, for example, in a time interval when no switch can be closed, that you must still scan just to make the invention valid or anything like that.

He invented it so he would not miss closed switches. And so that's the real meaning of that requirement in the

claims.

Q. How many balls are there on the Flicker playfield?

A. There are 3.

Q. Can there be simultaneous switch closures?

A. There can be simultaneous switch closures, that is correct, sir.

Q. With the Cleopatra arrangement you could miss those simultaneous switch closures, or very close together switch closures, because we have 3 balls in the playfield, correct?

A. That's problematical. It depends on how long the scan takes to complete the full 16 columns, sir.

Q. I understand that.

But we're talking about, you said you can't have switch closures very close in time one to the other; I point out to you, with 3 balls in the playfield, you can.

A. Yes, sir.

Q. Isn't that correct?

A. That's correct, sir.

Q. And if in Cleopatra one ball trips 22, and we are going back processing and beginning at the beginning, and a ball trips 23, you could miss the 23 switch. Isn't that correct?

A. I would have to check. Does Cleopatra have multiple balls, sir?

Q. I don't know.

A. Neither do I, sir.

Q. We're talking about the design of Cleopatra as applied to a number of machines.

A. Yes, sir.

Q. Do you know about those machines?

A. Yes, sir.

Q. Let's talk about the design of Cleopatra as a 2-ball game. Could it miss switches?

A. If the -- without knowing anything more about it, because you do not scan, if a switch were to close at just the wrong time, you could miss it, as Harmer said.

But, of course, recall that the designer of the Cleopatra game would put those switches in the matrix, I assume, in such a way that that would not be a problem. Otherwise it would not be a commercial game.

So apparently it was not a problem in the games that were designed.

Q. Is it your parameter that if it's a successful game it infringes?

A. No, sir.

Q. You will agree that the cyclic and sequential operation of Cleopatra and Spiderman is -- or, Cleopatra, is not the same as the cyclic type of operation of Flicker or the cyclic type of operation that was shown in the patent, right?

A. I don't agree with that at all, sir.

I think it's carrying out substantially the same

function, substantially the same way, with identical results.

Q. You're giving me a substantially. I'm asking you, is it the same as what's done in Flicker?

A. If you are referring to, does my reading of the claim on Cleopatra, the way I read that claim because of the --

MR. SCHNAYER: Mr. Lynch, you're interrupting his answer.

BY THE WITNESS:

A. When I take a claim like 45 and read it on Cleopatra, I look at the language in the claims. And that language is means plus function language.

In order to understand that I go to the specification and look to see what means are disclosed to carry out those functions.

And then in the infringing machine, in order to read that claim literally on it, I have to find those claims or something that is substantially equivalent to it.

This is substantially equivalent to it, and hence it reads literally.

And so it is present in the Cleopatra machine the way I understand the reading of the claims for infringement.

BY MR. LYNCH:

Q. I don't want you to talk about claims. I want you to talk about machines.

And you've answered my question. It, the Cleo, is not the same operation.

You might regard it as equivalent; we'll get to that later.

It isn't the same operation, isn't that correct, as the Flicker machine?

A. It is a different microprocessor, it is -- everything is different about -- what do you mean by the same operation?

Q The cyclic and sequential operation as done in the Flicker machine is not done in Cleopatra.

A. You are basing that question on the fact that when a switch is closed, detected closed, it restarts the scan at the beginning, is my understanding.

And there are situations in the Flicker program where the same effect occurs. Namely, whenever an event occurs which causes Flicker to perform one of these longer routines, and then it goes out and hits the multiplexing routine several times so it can keep the lamps and the digits bright, the switches are not being scanned. And hence there are columns also being skipped in the Flicker game under rare circumstances.

These occur very rarely and do not affect the operation of the game.

I see no difference whatsoever in that strategy.

Q. You see no difference at all?

A. I do not, between what is actually implemented in the Flicker game and what Cleopatra does.

Q. But you said what Cleo does is equivalent, but there's no difference. Is that your testimony?

A. No.

What I said was, if I'm reading the claim, it is substantially the same.

What I said was, the way the columns of the matrix

are scanned are no different, in general, in specific instances in the 2 games. That is, in Flicker also columns of switches are skipped now and then.

Q. Let's go to the lamp scan, Doctor.

A. Yes, sir.

Q. Cyclically and sequentially strobe the lamps, correct?

A. That is correct, sir.

Q. Likewise in the '441 embodiment, correct?

A. That is correct, sir.

Q. What happens in Cleo?

A. Lamps are direct driven.

Q. They are not cyclically and sequentially operated, correct?

A. They are not matrix multiplexed, so they would not be -- it's not appropriate to talk about cyclical and sequential at all, except from the self-cleaning point of view, which is carried out in the background program.

Q. Let's talk about Spiderman. Does that operate likewise?

A. Spiderman is also direct driven, the lamps, yes, sir.

Q. So neither are matrix multiplexed.

Let's go to the digits.

Well, let me ask you something about the lamp scan, now, Doctor: You mentioned something about zero crossings occurring in Cleo.

A. Yes, sir. I made an error in my testimony when I

discussed that.

Q. You made an error in your testimony.

A. Yes. I was not thinking properly and made an error.

Q. There is no zero crossing detector.

A. No, sir, I do not believe there is.

Q. There's no zero crossing detector in Spiderman.

A. That's correct, sir.

And I indicated that for both machines.

Q. You indicated that zero crossing exist in both machines, didn't you?

A. Yes. I was discussing the noise prevention immunity considerations of the game, and mixed it up with another game.

Q. And so all your testimony that talked about the noise prevention immunity from turning on lamps and sequencing lamps and all that, all of that testimony about how Spiderman and Cleo achieved that by zero crossing detectors is not the case with respect to those devices, correct?

A. The only testimony I gave about zero crossing with respect to Cleo and Spiderman was to list it among the noise prevention techniques.

My actual discussion of zero crossing was with respect to the Bally Freedom Game, sir.

Q. You indicated specifically, "The lamps, which are not matrix multiplexed" -- this is Page 1257 and 1258 -- "The

lamps which are not matrix multiplexed are directly turned on, but at the zero crossing point of the supply line."

A. I did say that.

Q. "So that again we have low noise generated when we turn on the lamps".

A. I did say that, sir, and that was incorrect.

And there's one more comment about Spiderman that's identical to that one about 2 pages further in my testimony.

Q. It's a little bit further than that.

A. All right.

Q. All right, let's talk about the solenoids.

A. Yes sir.

Q. How are the solenoids operated in Flicker?

A. The solenoids in Flicker are direct driven, sir.

Q. They're direct driven through a decoder, correct?

A. They are direct driven, there's a decoder in the circuit, that's correct, sir.

Q. And they're operated by the CPU, correct?

A. Yes, sir. Most of them are, sir, not all of them.

Q. Which ones are not?

A. The flipper, the solenoid that closes the flipper is direct driven, sir.

Q. Well, it's direct driven, but it's activated according to the patent through an optoisolator, isn't it?

A. That merely enables the flippers so that when someone is

not playing the game and there's no coin in it, you can't sit there and cause them to operate.

But at the instant you press the switch in, the switch is in series with the solenoid right here, and as long as the game is permitting you to push the buttons, they close, without the microprocessor using the decoder or any circuitry to close that.

Q. Well, if the microprocessor doesn't refresh the opto-isolator, they'll stop being driven, correct?

A. That is correct, sir.

Q. So if the microprocessor forgets about it, they won't be driven, correct?

A. If it forgets about it, sir?

Q. Yes, if it doesn't strobe the optoisolator and energize it.

A. But it does in the program.

am.

Q I understand that. But if something were to happen where that wouldn't occur, the flippers wouldn't work.

A If the optoisolator failed, for example, that would be a failure for the machine.

Q Or if that strobe line were cut.

A Or if that strobe line were cut, yes, sir.

Q Now, in that respect you testified a great deal about how in the Flicker machine the solenoids were operated at a time that nothing else was going on.

A That is correct, sir.

Q Can the flippers be operated at a time when nothing else is going on?

MR. SCHNAYER: Excuse me, Mr. Lynch. I think you cut off his answer, and he was trying -- I object.

THE COURT: Go ahead, Doctor. If you weren't finished, go ahead.

BY THE WITNESS:

A I lost my train of thought. Let me think just a second.

MR. SCHNAYER: Maybe we could have the question--

BY THE WITNESS:

A No, sir, I didn't testify that. Because the solenoids are constantly on while other things are going on.

What is not done is that while we're in the middle of cyclically and sequentially going through the array, we do not turn on or off solenoids at that time.

But once on, they are, through that decoder circuit, because these are AC driven solenoids, they're constantly being hit to operate.

BY MR.LYNCH:

Q I understand.

But so we understand, you spoke about each cycle and you said, "During part of the cycle that you're looking at switches, you don't operate solenoids, so there won't be noise."

And that was a noise-immunity technique of Flicker. Correct?

A That is correct, sir.

Q Now, what about the flippers, can the flippers be operated while you're scanning switches?

A The flippers are not controlled by the machine, and so the processor -- they are totally asynchronous with respect to anything going on in the computer program.

They can be operated at any time.

Q So in the Flicker machine, that noise immunity technique, there's an exception made for the flippers in Flicker?

A Out of all the solenoids those two are not run that way, that is correct, sir.

Q Now, they're AC solenoids, correct?

A That is correct, sir.

Q In the embodiment shown in the '441 patent they are

also shown as being driven by the CPU, but I don't know if it tells you whether they're AC or not.

Does the diagram tell you whether they're AC solenoids or not?

A Yes, sir. It says AC right there.

Q Fine. So in both instances in the Flicker game, and in the embodiment shown in the '441 patent, we have solenoids driven by the CPU that are AC solenoids, correct?

A That is correct, sir.

Q Now, and except for the flippers, those are sequenced in time so that the noise will not interfere with switch scanning, correct?

A That's the cart before the horse.

The program sequences itself in time so it will not have to do things at a noisy time.

You must turn on the solenoids when the appropriate event occurs, and then you offset from that things that you can do at an arbitrary time so you're not interfered with.

Q Now, you also indicated that the operation of solenoids put a real time constraint on the system, correct?

A I did -- if the -- if you are, for example, trying to hit a ball away from the bumper, that is a real time response constraint.

Q The pot bumper.

A The pot bumper, the slingshots.

Q The slingshots.

Now, let's take Cleo. How are the solenoids operated in Cleo?

A Some of the solenoids are operated by the microprocessor; others are direct driven, as are the flipper solenoids.

Q Now, let's take the solenoids that are direct driven.

How are the pot bumper solenoids driven on Cleopatra?

A They are direct driven.

Q So there's no real time constraint with the microprocessor design for the pot bumpers, correct?

A That's not true, sir.

You still have to detect the switch closure, because there's a score effect, and so there is a signaling switch on the pot bumper, and so you must still read that switch in time to light the digits and the lamps, and so forth. That is a real time constraint.

Q You do not have to respond to the --

The microprocessor does not have to respond to the pot bumper while the ball is on, correct?

A. The time you have to respond to that is dependent on the time it takes to light the corresponding score and all that, and that would be up to the game designer to determine that time interval. It would not be an awful lot different, but it might be different, but it need not be a lot different.

Q Well, so the Court understands, on Cleo, the pot bumpers and the great majority of solenoids are run basically the same way they are run on the electromechanical Flicker game, correct?

A. That is correct, sir. The only exception to that is they are enabled as a group, I believe, are they not, by the microprocessor.

I would have to check my recollection and see the diagram.

Q I wish you would.

A. Okay.

(Brief interruption.)

BY MR. LYNCH:

Q Other than the fact that the whole game is enabled by the microprocessor?

MR. SCHNAYER: Excuse me, Mr. Lynch. Isn't he referring to his notes or something?

THE WITNESS: But that is exactly what I am --

THE COURT: Excuse me for just a minute.

(Brief interruption.)

THE COURT: Thank you.

Let's take a ten-minute recess.

MR. LYNCH: Thank you.

(Brief recess.)

MR. LYNCH: I believe, your Honor, there was a question outstanding to Dr. Schoeffler about the solenoids in Cleo.

BY MR. LYNCH:

Q. Are they driven by the CPU?

A. Some of the solenoids are driven by the CPU.

I believe your question was referring to the flipper solenoids.

Q. The pot bumper?

A. Or the pot bumper solenoid, and it is not direct driven by the CPU. I had indicated in response to the ball hitting the bumper. I had questioned whether it was enabled or not, and I referred to a diagram here which shows some kind of an enabling device.

What I have here is insufficient to determine whether the computer turns it on or off.

It is not germane to the invention nor to the infringement, however.

So can we say about the solenoids in Cleo and Spider, some are driven by CPU and some not?

A. Yes, sir.

Q. Those that are not driven work substantially like an electromechanical game, don't they?

A. That is correct.

Q. The real time constraints as far as hitting a ball away from those solenoids is as in an electromechanical game, correct?

A. That is correct, sir.

Q. Now, there are also DC solenoids in those games, are there not?

A. That is correct, sir.

Q. Does DC solenoids -- do DC solenoids prevent advantages from a noise point of view, Dr. Schoeffler?

A. They allow some alternatives for noise prevention that is economical in those games; namely the steering diode across the solenoid for turn-off noise.

Q They do not have the problem of surging currents running through them, alternating currents, correct?

A Even with an AC solenoid, when you turn it on, the turn-on is gradual because it is an inductor. It is turn-off that is the problem in the AC solenoid.

The sizes of the currents are comparable in AC or DC.

Q Suffice it to say that the AC solenoids prevent or present more noise problems, isn't that correct?

A That is fair, sir.

Q Let's talk about the displays.

The displays in the Flicker game are cyclically and sequentially driven, right?

A If you don't mind, sir, thank you.

Are you talking about both lamps and digits, sir?

Q Display scan. No, the digits as opposed to the lamps.

A Oh, all right.

Q Displays as opposed to the lamps.

A To be consistent with the way I have testified, I have used display for both. So it might be wise to just indicate digit.

Q Digit scan?

A That is correct, sir.

Q That is true in the embodiment of the '441 patent?

A. That is correct.

Q. What do they use in Cleo?

A. They use a cyclical and sequential scan.

Q. What is the apparatus used in Cleo?

Do you remember GPKD?

A. Yes, sir.

Q. What is a GPKD?

A. The GPKD is a chip supplied as part of the vendor chip set in which the portion of the running of the cyclic and sequential column enabling of the digits is done, sir.

Q. Now, do you remember what GPKD stands for, Dr. Schoeffler?

A. Yes. That stands for general purpose keyboard display.

Q. The general utility of this chip was what?

A. For calculators.

Q. To run a display of a calculator, correct?

A. No, sir, to run the keyboard and the display of a calculator.

Q. To run in part the display of a calculator?

A. Well, to cost-justify a chip like that, then the vendor is selling it into a low cost unit like a calculator, and it was intended for both the keyboard and the display clearly.

Q. I understand that, but in a calculator, it runs a seven-segment display the same as the LED displays on Flicker, correct?

A. The displays in a calculator are not the same as the displays in Flicker because of power level remoteness, concurrent operation of switches, remote sensing, and all the other complexities in the pinball game.

Q. You previously testified that in the real time constraints of the invention of the '441 patent as recorded in 19-H that you strobe the lamps fast enough to appear continuous, and you strobe the displays likewise. Do you remember that testimony?

A. Well, that discussion was with respect to a large, quote, calculator, and I do not really agree with what I ended up saying there.

Q. But the thing is is that the displays on Flicker operate the same way as smaller displays on a calculator, the seven-segment displays, correct?

A. Not quite. The displays have other things that a calculator would not have like the noise-prevention hardware, the slow turn-on transistors, and things like this that you would not have.

They are there because of all the other things going on at the same time in the pinball machine. So they are not the same.

The computer program looks different. The sequencing looks different, and the like.

The only thing that is the same is that the

digits are made up of seven segments, and you hit them periodically, but there is so much else that is different. That is the dominant part.

6-3

Q. The display digits, the digits, are the same. We are talking about a digit scan here, correct?

A. That is correct, sir.

Q. The digits are the same, types of digits, that are used in calculators, correct?

A. Are you talking physically, or are you talking appearance or what? I am not sure what you mean.

Q. They are seven segment digits, correct?

A. The digits on many of these machines are seven segment display digits.

Q. The chip that is used on Cleo to drive the digits is the same chip that is sold by the Rockwell Company to drive digit displays on calculators, correct?

A. The portion of the chip that is used to create the column strobes is generated by the GPKD chip.

Q. And the GPKD chip is a chip that is sold by Rockwell to, in part, scan and illuminate 7-segment displays on calculators, correct?

A. Well, it actually does not do the illumination. That requires some power circuitry.

It generates the column strobes and the segments in response to the values of the digits that you wish to display and normally also scans the switches on the calculator keyboard, also.

Q. I just want to talk about the display part of it.

It does, in fact, operate the displays on calculators, correct?

A. It is part of the operation of the displays. It can be used for that on calculators and is used or was used.

Q. Now, we have here a switch scan, a lamp scan, and a digit scan, correct, in Cleo?

A. The lamps are direct driven. The only scanning of them would be self-cleaning.

Q. We have a switch scan and a digit scan?

A. That is correct.

Q. Are they done synchronously?

A. No, sir,they are not as best I could determine from the available material.

Q. They are not done synchronously?

A. As best I could determine, I could not determine that they were synchronized.

Q. Neither are they the same matrix or are they synchronous?

A. That is correct, sir. That is why I could not read claim 46 on Cleopatra.

Q. Now, with respect to Spiderman, how is the digit display operated?

A. The digit display on Spiderman is -- they are done cyclically and sequentially, if I may use that term. It does not use a GPKD chip. It uses a normal chip that is part of that particular vendor's chip set called the RIOT.

Q. The RIOT chip?

A. The RIOT chip.

So each one is using the gender -- the vendor specific chip.

Q. That RIOT chip, do you know if it is otherwise used for similar type display activation and control?

A. The RIOT chip, if we may use that abbreviation, is a general purpose input/output chip, so that anyone who uses the 6502 microprocessor uses that for everything. That is for getting data into the microprocessor or sending signals out of the microprocessor.

Q. Now, we also talked about a number of other items in the Flicker and the other devices, noise, et cetera, type of aspects of the design.

The first of which I would like to ask you about, Doctor, are the use of optoisolators.

Now, you talked about that as a noise immunity technique in Flicker, correct?

A. I called it a noise prevention technique because it is a hardware --

Q. Noise prevention technique?

A. -- technique.

Q. That exists in Flicker, correct?

A. That is correct, sir.

Q It exists in the '441 patent embodiment, correct?

A Yes, sir.

Q Does it exist in Cleo or in Spiderman?

A No, sir.

Q Secondly, low beta or slow turn-on transistors, these are present in Flicker, correct?

A That is correct, sir.

Q Is it present in the '441 patent embodiment?

A Yes, sir.

Q Is it present in Cleo or Spiderman?

A The cold lamp current is limited in those games in exactly the same way as it is in the Flicker game, sir.

Q By what component, Doctor?

It is not limited by the zero crossing as you previously testified?

A Right.

(Brief interruption.)

THE WITNESS: In the Gottlieb Cleopatra game, on the -- I am looking at the diagram that is labeled "Master Driver" -- my copy does not have an exhibit number on it -- but the lamps are driven by a transistor with a resistor at the base, and that combination of that resistor and transistor and the applied voltage controls the currents through the lamps.

Q What is the turn-on time? Did you measure it in

Cleo?

A. I did not measure anything in Cleopatra.

The limiting of the cold current size has nothing to do with the slow turn-on transistor that is in the Flicker.

Q. Oh. Well, does the Cleo use the low beta or slow turn-on transistor concept that is present in Flicker in the '441 patent?

A. The low beta transistor and the slow turn-on transistor concept are two different concepts for two different purposes.

Q. Let's take the low beta transistor concept first then.

A. The purpose of the low beta transistor is to limit the cold current in the lamps.

Q. Does such a low beta transistor exist in Cleo or Spiderman?

A. The combination of the resistor and transistor produces the same limiting current in Cleopatra and Spiderman, sir.

Q. The same limiting current. Could you explain that, Doctor?

A. The objective of cold lamp current limiting is to limit the surge of current that enters the lamp when you turn it on when it is first cold.

So the size of the current is controlled, in this case, by a particular transistor and its associated game, whereas in contrast Frederiksen uses a transistor which he

called a low beta transistor because he used a Darlington because he was driving an entire row of transistors of lamps like this, whereas in the Cleopatra and Spiderman, because they are direct driven, a separate transistor is used for each. But it produces substantially the same function substantially the same way and exactly the same result.

Q. Let me examine you about that.

The Flicker and the embodiment of the '441 patent light the lamps 1/16th of the time, correct?

A. That is correct, sir.

Q. The lamps in Cleo and Spiderman are activated 100 percent of the time they are on, correct?

A. During the interval when they are on, they stay on continuously. That is what is meant by direct driven, not multiplexed.

Q. There is a great deal more problem in limiting the current surges in the Flicker and the embodiment of the '441 patent, isn't that correct?

A. I would not call it a greater problem. There is a greater need because of the potential for more noise, but the technique that is used to limit it is equally applicable in the two cases with equal ease.

Q. You say that there is a transistor with a resistor that is used here that is equivalent?

A. That is correct, sir.

Q Now, do you know what effect that, in fact, has or what the design purpose of that transistor and resistor was?

A I know nothing about who designed this or why they designed it.

However, in examining the result, it is clear from the schematic that this carries out this function. Why or who is beyond my personal knowledge.

Q Let's talk about a slow turn-on transistor.

That is present in the Flicker and the embodiment of the '441 patent, correct?

A That is correct, sir.

Q Is it present in Cleo or Spiderman?

A It is -- there is -- since Cleo and Spiderman do not matrix multiplex the lamps, there is no place to put such a transistor, and it is not present.

The slow turn-on transistor is present in the Flicker because the switches and the lamps are in the same columns of the matrix, and you are trying to prevent the lamp surge from hurting the switches.

None of that is applicable here.

Q Now, insofar as noise is concerned, did you notice whether or not the Cleo and Spiderman were grounded?

A Yes. I looked in the cabinet.

Just to be sure --

(Brief interruption)

BY THE WITNESS:

A (Continuing) In the Cleopatra machine, I found no grounding or shielding in the base cabinet, but I found shielding in the back cabinet.

BY MR. LYNCH:

Q Shielding. How about grounding?

A Yes. There is a ground strap. I did not see it here

in my notes.

Q Both the Cleopatra and the Spiderman use grounding techniques, correct?

A Yes, sir, in the back cabinet, yes.

Q Neither Flicker nor the embodiment of the '441 patent disclose that, do they?

A Neither disclose that explicitly, sir, no.

Q Now, shielding of the microprocessor in the back cabinet, is that shown in Flicker?

A No, sir.

Q Is it disclosed in the '441 patent?

A No, sir.

Q Is that done in Cleo and Spiderman?

A Yes, sir.

Q How about RC networks to prevent noise? Are they shown on the Flicker game?

A No, sir.

Q Are they shown in the '441 patent embodiment?

A No, sir.

Q Are they present in Cleo or Spiderman?

THE COURT: Tell me again what an RC network is.

MR. LYNCH: It is a resistor capacitor network, your Honor. It is two components arranged in a way that it more or less filters out the high frequencies or low frequencies, depending on what you would like

to do.

BY THE WITNESS:

A There are some RC networks shown on the Cleopatra diagram.

BY MR. LYNCH:

Q Are you satisfied they exist in Spiderman as well?

A I believe so.

Q Now, this is the comparison of the devices and the way the result of a pinball machine is achieved, correct?

A That is a comparison of some very specific items.

As we started this whole chart, we indicated we were not attempting to read the claim on it. So I do not accept this comparison as being relevant to the reading of the claims on Cleopatra and Spiderman,however.

Q I understand that.

Let us talk about the devices themselves. They differ. The embodiment of Flicker, the embodiment of the '441, and the embodiment of Cleo and Spiderman differ as summarized on this chart?

A It is clear that Cleopatra and Spiderman differ.

Incidentally, Flicker and the embodiment in '441 are almost identical, if not identical. At least as is shown on this chart, I believe they are identical, in fact.

So they do not differ, but they differ only insofar as some very specific elements that you selected are

listed in one that are not in the other.

There are, of course, other things like the picture on the game that is different, and many other things that are different.

Q The paint is different?

A The paint is different, also.

Q Do you regard that as material?

A No, but the question of significance of the difference when reading the claims is important.

Q Now, you talked about reading the claims and said when you read claims, this is what you do.

When is the first time in your life you read claims on devices, patent claims?

A Patent claims, last August.

Q Last August was the first time.

Prior to that time you had no understanding or reading a patent claim on anything, did you?

A That is correct, sir.

Q Now, last August when you began reading patent claims on something, did someone tell you how to do it?

A Yes, sir.

Q. Who?

A. Mostly Mr. Schnayer and Mr. Katz worked with me to teach me how I should carry out my infringement studies.

Q. Did anyone else work with you to tell you how to carry out your infringement studies?

A. I cannot recall anyone else other than in meetings where there might be a third person, but the essential discussions of how to read the patent claims, I learned from those, as far as I recall.

Q. You never had a discussion with anyone else on how a claim might be interpreted or how you might read the claims of the '441 patent on the various devices used here?

A. The only exception was one evening I talked to Professor Kayton for a few moments, who was helping me to understand the patent terminology and the language.

Q. He was helping you to tell you how you might read these claims on the devices?

A. No, sir.

What they were teaching me how to do was how to carry out the infringement study and use the proper language and the like.

I carried out the infringement study, and what I gave you is my opinion.

Q. Now, the language that you are talking about is the language that you have used throughout this trial of

substantially the same means, operating in substantially the same way to achieve substantially the same results, correct?

A. All of the language associated with the means plus function elements in the claim, that is correct, sir.

Q. They told you that you should use that language, correct?

A. They emphasized that it was necessary to be precise and explained the language and what it meant, and I have attempted to use it in a precise way.

Q. Now, other than reading the claims of the '441 patent, on Cleopatra and Spiderman and Disco Fever and Flash and Batman, have you ever read the patent, the claims of any patent, on any other device?

A. I have read the claims of the '441 Nutting/Frederiksen patent on the Flicker machine, on the embodiment disclosed in the patent, and on the Fireball and the Freedom.

I attempted to do it on the Atarian and did not infringe on that game.

That, I think, is the totality of games I applied them to, sir.

Q. So have you ever read any other patents on other devices?

A. I have read patents, but I have not had to do infringement studies.

Q. So the totality of your experience in reading claims on devices comes in reading the '441 patent on the various devices you have indicated you read it on here, correct?

A. That is correct, sir.

Q. Now, you have also discussed this theory or principle or something of claim differentiation, correct?

A. Yes, sir.

Q. When did you first hear of the theory or principle of claim differentiation?

A. Sometime between last August and now when I was attempting to understand the relationship on successive claims that included other claims. This was explained to me what this terminology meant and what its implications were.

Q. Part of this education process that you were put through was by Mr. Katz, Mr. Schnayer, and others in connection with preparing you for your infringement studies, correct?

A. That is correct, sir.

Q. Now, in that study, I believe you indicated that when you looked at the Atarian, you did not even look at the various noise prevention techniques in that device at all, correct?

A. No, sir, because the prerequisite for infringement is matrix multiplexing of the switches. So I looked for that first, and it was not even present. So there was no need to go further in my mind.

Q. As you testified previously, in the Atarian, the processor multiplexes the switches, scans them; that is, with a time division multiplexing technique, but they are not

arranged in a matrix, correct?

A. That is correct, sir.

Q. You read Claim 1 as requiring a matrix?

A. That is my opinion, sir.

Q. You also read Claim 45?

A. Claim 45 is what we are looking at, that is correct, sir.

Q. Now, in that reading of Claim 45, I had marked up a copy of Claim 45 as 19(e)(1) and (2). You indicated, I believe, that sub-paragraph (e) as it appears on this exhibit, Defendants' Exhibit 19(e)(1), which provides for a plurality of response means, et cetera, inherently includes stuck switch error recovery, correct?

A. May I see the next page, too, sir, so we can see the whole thing?

(Brief interruption.)

THE WITNESS: Okay. Claim 45 includes a number of different elements which lead to the need for matrix multiplexing which is operative, and to understand what that means -- and it uses means plus function language.

In order to understand what that means, we go to the -- we go to the specification to determine precisely what function is disclosed or what means is disclosed to carry out that function; namely, operative matrix multiplexing.

As a result of that, it is clear that real time response and error recovery is required, and that includes,

as a consequence, the stuck switch error problem.

Q. Fine.

Now, when we are making these comparisons, when you looked at the Atarian, you did not look at how they handled stuck switches?

A. I did not look at it. I do not believe that I had the materials even to look at at any rate. However, it was irrelevant to infringement because they are not arranged in a matrix.

Q. Now, we did go through the fact that if we look at the words of (g), the words of part (g) --

A. Would you mind pulling that out just about 6 inches?

(Brief interruption.)

THE WITNESS: Thank you.

BY MR. LYNCH:

Q. The words of Part (g), without more; that is, the recitation in part (g) of Claim 45 at 19(e)(2), having a multiplexing means operatively connected, et cetera -- that those words find a response in the Atari device, just the words in (g)?

A. I do not know what you mean by the words.

Q. The Atari device has a multiplexing means operatively connected to the processor, doesn't it?

A. That is means plus function language.

The only way I know how to read that is to go back to the specification and see what it means, and that says matrix multiplexing. There is no question about that in the specification.

Q. I understand that.

A. So it does not appear in the Atarian because the switches are not in a matrix.

Q. Let's make believe I am not reading a claim, Doctor.

Let's make believe I am reading words.

Does the Atarian have a multiplexing means?

A. To read the word, I need to know the understanding of the word.

If you want to define multiplexing as being non-matrix multiplexing, then the switches in the Atarian do have a non-matrix multiplexing scheme, that is correct.

Q. If I were to have told you before August a multiplexing means, you would have said yes, that is a multiplexing means, wouldn't you?

A. No. I would have been slightly wondering what you mean because there are lots of different multiplexing means, and I would have asked for clarification.

Q. That would have been one of them, what the Atarian has?

A. That is one of very many, yes.

Q. Now, that means whatever it is in the Atarian is operatively connected to the processor, correct?

A. I did not pursue it to determine that it was operatively connected to the processor because that carries the connotation then of the real time response. It carries the connotation of suitable and proper combination of noise prevention and noise immunity, et cetera, et cetera, and I stopped when it was clear that it was not infringing.

Q. Now, let's go down to these noise immunity techniques, the use of RC networks, shielding, grounding, those items there.

Doctor, are those items items that you regard as

equivalent of the techniques disclosed in the '441 patent?

A. The reason I was so hesitant about those lines on the chart is that misses the whole point of the noise prevention and noise immunity. It is not a situation where we are looking for individual elements like optoisolators or low beta transistors or double reading of switches and the like.

It is that the operative matrix multiplexing, which is the key in (g), and something like Claim 45 requires that there be the proper combination of hardware prevention techniques and software noise immunity techniques, so that the machine will operate in its intended environment in a practical manner.

So whether or not you use RC networks, that is not required.

Whether you have low beta transistors, that specific one is not required.

What is required, all right, is that you have a combination of hardware noise prevention techniques and software noise immunity techniques that working together, okay, with the computer program and the matrix multiplexing, give you the adequate operation.

Now, in fact, most of the infringing machines include many of the ones in the Flicker, but it is not necessary that each one of them be in or that on a one-to-one basis that you define them to be equivalent.

THE COURT: Are you saying that any combination, any successful combination, of parts would infringe --

THE WITNESS: No, sir.

THE COURT: -- whether or not they are shown in the specifications of the '441 patent?

THE WITNESS: No, sir.

What I am trying to say is that the invention, of course, is microprocessor control of a pinball game and using operative matrix multiplexing.

Now, in that means plus function language, when I go to the specification and say what does -- what are the operative matrix multiplexing means disclosed, what I find out is there is a philosophy for how to put this thing together there.

THE COURT: Well, is it the philosophy?

THE WITNESS: It is the combination, that is exactly it. It is not just devices.

THE COURT: Combination of what?

THE WITNESS: All right, it is the combination of hardware devices to do noise prevention.

THE COURT: But are they particular devices?

THE WITNESS: Not particular devices.

THE COURT: Generic?

THE WITNESS: Generic devices, and in the combination with the software techniques. Recall, in that program we tried to emphasize that in this routine, you double read the switches, and in this routine that you offset in time.

What we try to show in that combination is the combination of the matrix, and some of the hardware techniques allow you to do things in software, okay, that if you did not do it in software, would make for very extensive hardware.

So it is the net combination of means that makes it operative.

Whether any one particular one is there or not, okay, in my view, is not relevant because each of these machines has a different structure, and the technology keeps changing with time.

THE COURT: How does that approach square with

your view that you look to the specifications to determine the meaning of the claims in this combination means plus function patent?

THE WITNESS: Well, when I go to the specification, it is clear in my mind that I see these matrices, and you need matrix multiplexing. That is the heart of the invention, all right.

THE COURT: Why do you say that is the heart rather than something else being the heart?

THE WITNESS: Oh, because throughout the specification, from beginning to end, it is clear in the special embodiment and all discussions about it that everything centers around the use of matrix multiplexing.

Then along with that, he keeps talking about slow turn-on transistors and low beta transistors and the like, altogether with the matrix and that organization, to set it up, so that the software can carry it out.

In contrast, if you went back to before the microprocessor and looked at the way these things were done, very expensive hardware systems were used. What was new and innovative in this use of the microprocessor in the pinball machine was the recognition that we no longer do everything in hardware. We can do lots of things in the program now to make it effective and to make it work, but they have got to be chosen, not just so you have 14 hardware things and 3

software. You have got to choose the hardware structure and that software structure so they work together like hand in glove to carry out that real time application.

THE COURT: Would anyone have been able to devise a pinball machine utilizing matrix multiplexing and not infringe '441; that is to say, is there any combination of elements that would include matrix multiplexing that would not infringe?

THE WITNESS: If you did not matrix multiplex the switches, it would not be covered by the claims. So if you matrix multiplex the digits and the lamps but not the switches, it would not violate the claims that we are reading.

However, I think the problem includes the noise prevention and noise immunity successful combination.

When people started trying to apply this microprocessor, it was not clear how, and you could think of lots of ways to do it.

What Frederiksen did was come up with this combination that worked.

Now, if we look at the infringing machines, we see that almost all of the things he did are also done in those infringing machines. So, in fact, they are almost the same techniques being used.

But, in general, as the technology changes, we have a different microprocessor this year. We do things

differently.

For example, Frederiksen used a single matrix in his machine. That is because he was using that 4004 microprocessor of that era.

As soon as the eight-bit microprocessors became available, it was much more effective to go, in my opinion, to separate matrices. But you are still applying the heart of the invention. You are still applying the matrix multiplexing. You have got to live with the noisy environment of a pinball machine. It is absolutely an essential, and you cannot afford to put in real expensive noise-prevention techniques.

So you select from the available economic ones and apply computer programmer software so they work together to do it operatively.

THE COURT: If you have answered my question, I am not sure I have understood the answer.

Are you saying that if you are successful in diminishing noise to an acceptable level and you use matrix multiplexing of switches, then regardless of what other devices and apparatus you have used to achieve that result, you have infringed?

THE WITNESS: It requires both switches in some of the displays to be --

THE COURT: Which displays?

THE WITNESS: Either the lamps or the digits or both.

THE COURT: Why do you say that?

THE WITNESS: Claim 45 explicitly lists the displays.

But I am saying that if you have a microprocessor control pinball game and you matrix multiplex the switches and you matrix multiplex some of the displays and you can make it operative in its intended environment, so it has got adequate real-- what we call real time response, adequate recovery, that means that the noise has been prevented probably by a combination of hardware and software, and it infringes the claim read-on.

THE COURT: All right, thank you.

6-9

BY MR. LYNCH:

Q Let me just supplement this chart.

I left off line filters as a noise prevention technique. That is not present in Flicker or the embodiment of the '441, is it?

A That is correct, sir.

Q Both Cleo and Spiderman use it, don't they?

A There is a line filter in each, that is correct, sir.

Q Now, in connection with --

Now, what you discussed with the Court a moment ago about how one would utilize noise prevention, noise immunity, and all this to make a successful game, correct?

A That is correct, along with the matrix multiplexing, et cetera.

Q That is all included in the claim in the word, operatively, correct?

A No, sir. When I used that statement before, it was sort of a shorthand.

If we go through the elements starting on the previous page, it actually appears in several places, and the word, "operatively," as we previously indicated, appears in several places.

You have to read the claim as a whole. But what it says is that we must end up with operative matrix multiplexing of a microprocessor controlled pinball game, and

the means to carry out that function involved an adequate or proper combination of hardware noise prevention and software noise immunity is precisely what I testified.

Q Now, let's go to the claim.

Just so we understand it, in (g) there is a multiplexing means. What, in fact, is the multiplexing means in Flicker or the '441 patent?

A The multiplexing means includes the matrix, which includes the switches, digits.

You did say Flicker, did you not, sir? I am sorry.

Q Yes.

A It is the matrix and its associated circuitry to cyclically and sequentially scan that matrix.

Q So the multiplexing means is, in effect, the decoder, in Flicker?

A No, sir.

Q The multiplexing means that is operatively connected to the processor for cyclically and sequentially enabling the signaling means --

Now, the signaling means are the switches, right?

A The signaling means are the switches and their associated circuitry.

Q The multiplexing means is separate from the signaling means, correct?

A The multiplexing means includes the matrix, the drive

at the top, the slow turn-on transistors, et cetera. You really cannot read this thing a word at a time and decode each word -- I am lost -- because it's multiplexing means operatively connected to the processor.

This includes your decoder at the top in the Flicker for generating what are called the mux drive signals on that schematic and then the slow turn-on transistors and the remainder.

Q Let me ask you this, Doctor.

Have you been over all of the claims that were originally charged, that defendants were charged with infringing?

A Not in detail. I do not know what you were-- what the defendants were originally charged with.

Q Well, did you--

A I have read through all your 95 claims but not as thoroughly as I have attempted to do 45, et cetera.

Q Do you know if all of the claims require multiplexing in a matrix of both switches and some displays?

A It is my understanding that there are some claims that do not.

Q Now, given that as a proposition, what is the invention, Doctor?

Is the invention multiplexing switches? Is the invention multiplexing switches in some displays? Is the invention multiplexing displays alone?

A The invention involves microprocessor controlled pinball games using matrix multiplexing, okay, that is operative, which means that in its intended environment, the noisy environment, which you have alluded to and other people have alluded to, including myself, that it operates successfully, with associated real time response where needed and with adequate error recovery. That is the invention.

When I read Claim 45 on it, that requires matrix multiplexing of the switches in some displays. And I have to look at it on a claim-by-claim basis to interpret it beyond that.

Q But given the fact that some claims do not require the multiplexing of both displays and switches, what is the sine qua non of this invention? What is the thing without which we can know we do not infringe?

A I can do that only on a claim-by-claim basis. It is clear that Frederiksen was able to successively invent a microprocessor controlled pinball game that was very effective, producing a design that today is probably still the best way to do it, where the only change even today is due to the changing technology of some different kinds of microprocessors.

Now, to read infringement, the only way I know how to do it, unfortunately, is on a claim-by-claim basis.

If I am given a machine, I think I know how to read the claim on it to determine whether it infringes.

Q But you cannot tell me if there is a thing without which I can know I do not infringe this patent?

If I have any matrix multiplexing of any switches or any displays, I might be infringing this patent, right?

A I would have to go through the claims very carefully, but since only ones that are being called on here are 45

through et cetera, why, I have not done that or attempted to do that, nor do I know if that is the proper thing to do.

do

Q. But you are aware of the fact that there are claims in this patent that call for multiplexing of only the switches, correct?

A. I believe there is such a claim, but I would want to re-read it myself before I answered affirm --

I know there are other claims that refer only to a portion of the system.

I would want to study them if that were in issue.

Q. And claims that refer to multiplexing of only displays, correct?

A. I believe there is such a claim.

Q. Now, Doctor, the last question I would like to ask you about these claims is did you review the file history; that is, the history of prosecution of these claims including Claim 45 in the Patent Office?

A I did not read the proceedings.

I have read so much in this case. I do not know whether I may have perhaps read excerpts from it, but I did not, to my knowledge, review that, which I believe are all those books over there on that table.

Q. Did you encounter any occasion during the prosecution of the '441 patent, either originally or through its reissue stage, where the examiner rejected a claim of the type of 45, which does not say the word, matrix, based upon prior art

that had multiplexing techniques which involved multiplexing not in a matrix?

Did you follow that question?

A. Well, I was not involved, and I have never read anythin about anything like that to my knowledge.

Q. Were you told by Mr. Katz or Mr. Schnayer that the history that these claims went through in the Patent Office could be relevant to what they mean?

A. The only discussion I ever recall on that subject was after you raised the question early in my testimony, and they indicated that I did not have to take time out to read them.

Q. Did they indicate to you that it might be relevant?

A. That was the only reference to it.

Q. All right, Doctor, we have the back of the machine open. Could you go over to the machine?

THE COURT: Let me ask is this going to be a lengthy line of questioning?

MR. LYNCH: No, your Honor. I was hoping that I would be finished today, your Honor.

THE COURT: Okay. Well, I would like to recess within a few minutes.

MR. LYNCH: When I say lengthy, I mean 10 minutes or 15 minutes, your Honor.

THE COURT: Well, I have --

MR. LYNCH: I think I can wrap it in that time.

THE COURT: I think we had better go over then until tomorrow morning because I have some things to do.

So let's shoot for 9:00 o'clock tomorrow morning. Is that okay?

MR. LYNCH: We will do that, your Honor.

THE COURT: 9:00 o'clock tomorrow morning.

(Brief interruption.)

THE COURT: Oh, I have got three criminal cases.

Okay, 10:00 o'clock, 10:00 o'clock tomorrow morning.

MR. SCHNAYER: Thank you, your Honor.

MR. LYNCH: Thank you, your Honor.

(Whereupon an adjournment was taken herein to 10:00 a.m. of the following day, Thursday, March 15, 1984.)